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FARMERS' BULLETIN 1266
UNITED STATES DEPARTMENT OF AGRICULTURE

PREPARATION *of* PEACHES *for* MARKET



STANDARD GRADES and more careful attention to the harvesting, handling, and packing are to-day conspicuous needs of the peach industry in the Eastern States. Each year large numbers of shipments are received in the consuming centers of the country which, on account of immaturity or improper methods of grading and handling, are sold at prices which represent severe losses to the shippers. The situation is rendered even more serious because the presence of poor fruit on the market weakens the confidence of the consuming public and so affects the sale of the good stock as well.

This bulletin describes the methods of preparing the peach crop for market which have been used successfully under various conditions, and will serve as a basis for comparative studies.

Contribution from the Bureau of Markets and Crop Estimates

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PREPARATION OF PEACHES FOR MARKET.

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PEACHES ARE GROWN in the States east of the Rocky Mountains under a wide range of conditions, and several different methods are used in preparing the crop for market. The season of the year at which the fruit ripens, the variety, the distance to market, the purpose for which the fruit is to be used, and the character and availability of labor are all factors which help to determine the stage of maturity for picking, the choice of packages, and the type, arrangement, and equipment of packing houses. These are matters of great interest in handling a crop so extremely perishable. To make certain that the harvesting and packing methods employed in any particular case are best suited to the local conditions, it is essential that a study be made of the various handling practices in use over the country.

HARVESTING.

In harvesting peaches the picking operation must receive the most careful attention, for the condition of the fruit upon arrival in the market depends largely upon the stage of maturity at which it is picked and upon the care with which it is handled. The peach ripens so quickly that in two or three days it will advance from a stage which is so immature as to affect the edible quality to one which is too far advanced for shipping, and for that reason the determination of the proper stage of maturity is especially important. Indeed, there is no consideration of greater consequence in determining

¹ The investigations on which this bulletin is based were planned by W. M. Scott, formerly Specialist in Fruit Grading and Standardization, and a draft of a bulletin was prepared by H. C. Hetzel, Investigator in Marketing, who conducted the original investigations. This material was later checked and supplemented by the author and E. W. Stillwell, Investigator in Marketing Fruits and Vegetables.

the market value of the fruit, but in spite of this fact few growers manage to pick their peaches uniformly at the proper stage.

Growers should make it a point to find out in what condition their fruit arrives at its destination. If it is impracticable to check the accuracy of their observations in the field by visiting the markets, much valuable information may be secured through correspondence with their representatives.

TIME OF PICKING.

It should be kept in mind that the fruit should reach the market nearly ripe enough for eating but firm enough to be handled through the ordinary channels of trade. The determination of the degree of ripeness at picking time to insure this condition depends upon the variety and the distance to market. In actual practice, however, the time taken to reach market is not so important as might be imagined, as the ripening processes are materially retarded by the use of refrigerator cars. Experience has shown that peaches may be picked in Georgia at about the same stage as in New Jersey, Virginia, West Virginia, and Maryland, although there is considerable difference in the time required in transit from these points to the principal markets. The ultimate destination of the car is seldom known at the time of picking, and consequently it is necessary to judge the proper stage on the basis of the most distant market likely to be used.

In the Middle and South Atlantic States the following simple rule may be found helpful in picking most varieties: Pick the fruit approximately 48 hours before it reaches the proper maturity for eating. This length of time is based on average weather conditions. Changes in the weather should receive careful attention, as fruit which has been maturing slowly during a week of cool weather will ripen with great rapidity if it turns hot and muggy, and conversely, fruit which has been ripening very rapidly may be retarded materially by a few cool days. Careful observation of the changes in the appearance of the peach during the ripening process must be made in order to estimate this time with certainty, but with a little experience it is not difficult to judge the proper stage with a fair degree of accuracy. One sign that the fruit is about ready to pick is the change in the ground color from the green color indicative of immaturity to a light yellow in the case of yellow-fleshed varieties or to a creamy white in the case of white-fleshed varieties.

In addition to general observations, the characteristics of each variety must be studied separately, as some deteriorate very quickly after reaching maturity and others relatively slowly; some ripen unevenly and still others drop badly as they approach maturity. For

instance, the *Champion*, one of the earlier varieties, ripens so quickly and deteriorates so rapidly that for shipment to any considerable distance it must be harvested when it is hard and of a whitish green color. The *Hiley*, which is also an important early variety, ripens much more slowly than other early varieties and may be left on the tree longer after it begins to show some indication of maturity. The *Elberta*, one of the best varieties for long-distance shipment, must be picked promptly after reaching a certain stage of maturity in order to avoid loss from dropping.

While the ideal stage must always be kept in mind, it must be remembered that there are usually many practical difficulties which,



FIG. 1.—Picking peaches in the Fort Valley, Georgia, district. Note the round oak stave baskets.

especially in the case of very large crops, make it impossible to remove all of the fruit at just the proper time. Under such conditions the best practice is to include in each picking fruit which, although mature, would be improved somewhat in quality by remaining on the tree for a short time. Indeed, if any variation is necessary from the rule it is always better to pick slightly too green than too ripe, for while immaturity impairs the quality of the fruit, over-ripeness may and frequently does result in a total loss of the shipment.

Because of its tenderness and short life, picking at the right time is more important in the case of the peach than with most fruits and the greatest care and good judgment must be exercised if the serious losses which are sustained annually from shipping immature or over-

ripe fruit are to be avoided. Each year, in the effort to get the high prices usually obtained for the earliest shipments, many carloads of peaches are packed which are so green that they shrivel instead of ripening and are sold for almost nothing. Unfortunately these losses are only a part of the injury to the industry, as the consuming public soon loses confidence in the quality of the product, and this attitude is promptly reflected in the market price of the whole crop.

CARE IN PICKING.

The question of care in picking is second in importance only to the determination of the proper time. Pickers frequently toss the



FIG. 2.—The round 8-bushel stave basket is a popular picking container.

peaches into baskets on the ground or pour them carelessly from the picking baskets into the orchard boxes or baskets used for hauling the fruit to the packing house. Surprisingly enough, this occurs even in orchards where the fruit is handled with scrupulous care after arriving at the packing house, and consequently the need for closer attention to the picking operation can not be too strongly emphasized. Badly bruised fruit is practically worthless for shipping. Furthermore, not only is the cost of sorting increased

by its presence, but since the bruises are not always readily detected at this time, much injured fruit may be packed, which is peculiarly subject to the entrance of decay organisms and endangers the sound fruit.

To provide a check on the work, each picker should be required to place in each basket a ticket bearing his number and a penalty should be imposed for failing to do the work properly. Also, the grower or a competent foreman should spend enough time in the orchard to

inspect the work from time to time and to see to it that the work is properly done.

PICKING UTENSILS.

There are no special features requisite for picking utensils except that, particularly in handling tender varieties, it is best to use a container which can be used in hauling the fruit to the packing house, as emptying fruit from one receptacle to another increases the amount of bruising. The $\frac{3}{4}$ -bushel round stave basket (see fig. 2) is the most popular for this purpose, although hampers are in common use. Round baskets made of oak or elm staves are employed almost exclusively in Georgia, Virginia, West Virginia, and Maryland. They are durable and are satisfactory containers in which to haul the fruit to the packing house. The only objection to such baskets is that in picking they do not permit the free use of both hands. In Texas the bushel round stave basket, which is used almost exclusively for shipping, is also used for picking.

The 16-quart and 20-quart hampers are popular picking containers in the Middle and North Atlantic States and in other sections where they are employed as shipping packages, but they frequently are very frail and begin to break up after a few days in the orchard. To avoid this loss it is the practice of some growers to send them to the orchard once for use in picking and then to use them as shipping packages. Because of the small base the hamper often upsets after being filled, but this can be avoided by the pickers exercising a little care in placing the baskets.

Drop-bottom picking sacks are employed to a considerable extent in the Ohio peach belt and in many of the large orchards of Texas and Arkansas. With few exceptions the use of these sacks is confined to harvesting the Elberta variety.

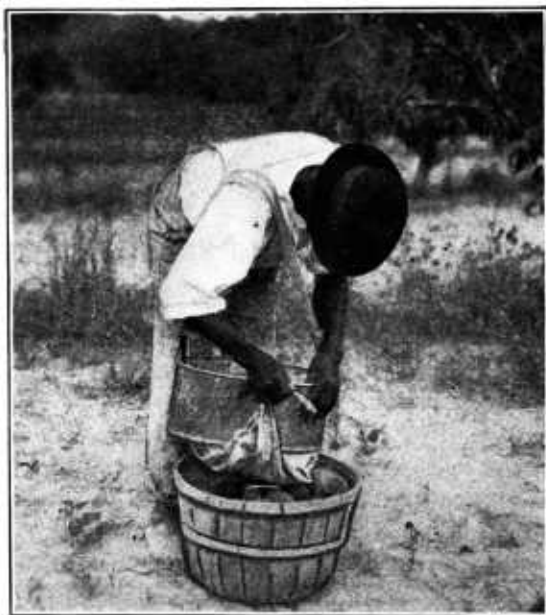


FIG. 3.—Drop-bottom buckets are sometimes used for the firmer late varieties.

Of the various kinds of baskets, the most desirable seems to be one consisting of a wire frame covered with canvas. Drop-bottom buckets (fig. 3), operating on the same principle as the drop-bottom picking sacks, are also used, but both sacks and buckets of this type are open to the objection that the fruit must be transferred to other containers for hauling to the packing houses.

In some instances hampers and baskets have been used to much better advantage by carrying them under one arm, supported by a strap passing over the shoulder. The strap is caught into each side of the basket by means of heavy wire hooks. In this way the picker is permitted the use of both hands and the speed of the work is increased to a marked degree. The temptation to put the basket on the ground and toss the fruit into it is also avoided. A basket carried in this manner has all the advantages of the picking sack without necessitating the emptying of the fruit into orchard boxes or other containers for hauling. The straps should be wide enough not to chafe the picker's shoulder and the hooks should be large enough to be easily attached and released.

HAULING FROM THE ORCHARD.

Various types of wagons are used in hauling peaches from the orchard to the packing house, but any wagon used for this purpose should be equipped with springs to reduce the amount of injury from bruising. The most convenient type has a low bed to facilitate loading and unloading, but on account of the relatively heavy draft most growers prefer wagons of the usual height equipped to accommodate either one or two layers of baskets. These wagons are usually about 15 feet 6 inches long and 46 inches wide, accommodating 35 or 36 $\frac{3}{4}$ -bushel picking baskets to the tier. (See fig. 4.) Where two tiers of baskets are hauled, the wagon is provided with crosspieces about 20 inches above the wagon bed upon which loose boards are laid to support the second. A deck may be made, divided in the middle and equipped with hinges, so that it may be raised and lowered easily. It should be built in lattice form, of light strips, and supported, when down, by small posts. Where the ground is fairly level wagons equipped with platforms, known as flats (fig. 5), are used for hauling large loads without the necessity of putting on two tiers of baskets, and smaller flats are sometimes used for hauling between the tree rows.

In large orchards, where the distance to the packing house is considerable and the rows of trees are close together, it is often found necessary to use small one-horse wagons for hauling the peaches out to the main roadways, where they are transferred to larger wagons. These small wagons preferably should be of the cut-under type.

Although rehandling is objectionable, under certain circumstances it is preferable to driving a two-horse wagon between the trees.

The operation of hauling fruit to the packing house must be carefully organized. Enough teams must be employed to haul the



FIG. 4.—A double-decked wagon used for hauling peaches.

fruit out of the orchard soon after it is picked, yet without undue haste. Commonly, this work is carelessly and inefficiently performed, the fruit not only being handled roughly and allowed to remain a long time in the orchard, but also hauled so unsystematically and



FIG. 5.—Large loads can be hauled on "flats" without the trouble of stacking the baskets.

at such irregular intervals that the packing-house operators are alternately idle and rushed in consequence. It is a serious matter to have the whole packing crew without work, waiting for peaches to be hauled from the orchard, and yet this is not an unusual occurrence. A capable foreman should be in charge of the hauling, to direct teamsters, and to insure the careful handling of the fruit.

PACKAGES.

The shipping package is a more important factor in marketing the peach than in marketing most of our other fruits. To reach distant markets in good condition this tender fruit must be shipped in a container that will insure the least possible injury consistent with practicable handling methods. The most suitable package for a shipping section or for an individual grower depends upon the varieties grown, the distance to market, the kind of labor available, market preferences, and, to a certain extent, upon the season of the year. At the present time the 6-basket carrier, the hamper, and the round stave basket are used in shipping the peach crop produced in sections east of the Rocky Mountains. The western box has not met with favor in this territory.

THE SIX-BASKET CARRIER.

The 6-basket carrier, or Georgia carrier, as it is commonly called (shown in fig. 6), was used almost exclusively in that State for 25 years, but for several years past it has been giving way to a considerable extent to the round stave basket. It is also used extensively in Virginia, West Virginia, Maryland, and to some extent in New Jersey, where the varieties are largely the same as in Georgia. The carrier is especially suited to conditions where such varieties as the Carman, Hiley, and Belle are grown extensively, as peaches put up in this package receive the careful handling and attractive display necessary for early, tender varieties.

The carrier contains six 4-quart till baskets placed in two tiers, with a dividing tray to prevent the fruit in the lower from being bruised by the pressure from the upper baskets. It is 22 inches long, 11 inches wide, and 10 or 10½ inches deep, inside measurements. As the baskets are the same size in crates of both depths, it is easier to secure a high bulge to the pack in the shallower crate. However, in the case of the 10-inch crate cleats are used to raise the lid, while with the 10½-inch crate the cleats are dispensed with. A reasonably high pack is very desirable to offset the settling in transit and to hold the fruit tightly in place. The 10-inch crate is in general use in most sections, but the 10½-inch size is more popular in New Jersey.

To protect the peaches on the top of the package, pads made of excelsior covered with wrapping paper are placed over the top of the fruit. For convenience these pads are sometimes sold attached to the cover, but they may be obtained separately. Corrugated paper pads are used by some shippers for the same purpose. The use of excelsior pads or cushions is recommended, as careful observations have shown that packages so equipped arrived in the markets with much less bruising than those without them, and there seems to be no evidence to show that the pads interfere in any way with the refrigeration.

The use of the carrier encourages more careful sorting than is commonly practiced when the fruit is packed without any definite

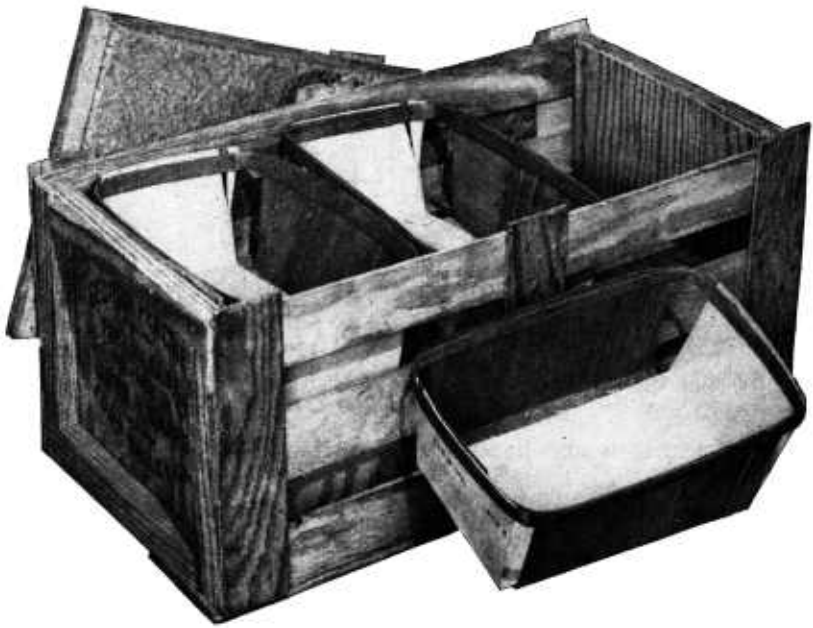


FIG. 6.—The 6-basket carrier contains six 4-quart tins.

order of arrangement, as each peach is handled separately by the packers, thus affording an added opportunity to sort out the over-ripe and defective specimens. The arrangement of the fruit in the basket contributes to the attractiveness of the package, and also minimizes the danger of injury from bruising. The open spaces between the baskets permit a free circulation of air and facilitate refrigeration in transit.

The principal objection to the carrier is that packing is slower and more expensive than in the case of either the hamper or round stave basket. In Georgia this work was formerly done entirely by professional orange and tomato packers from Florida, but local

help is employed extensively now. The labor situation has been an important factor in bringing about the use of the round stave basket in the region where the carrier was formerly employed almost exclusively.

In the Middle Atlantic States the carrier has been a satisfactory shipping package for all varieties which are shipped before the Elberta and for a part of that crop as well. Late varieties, such as the Smock and Salwey, are usually shipped in hampers or round stave baskets. The carrier has not been popular in western New York, Ohio, Oklahoma, Texas, and some other sections where the Elberta is the leading variety, as this peach is used extensively for home canning purposes and can be shipped in bushel baskets with little injury to the fruit and at a relatively small cost for packing.

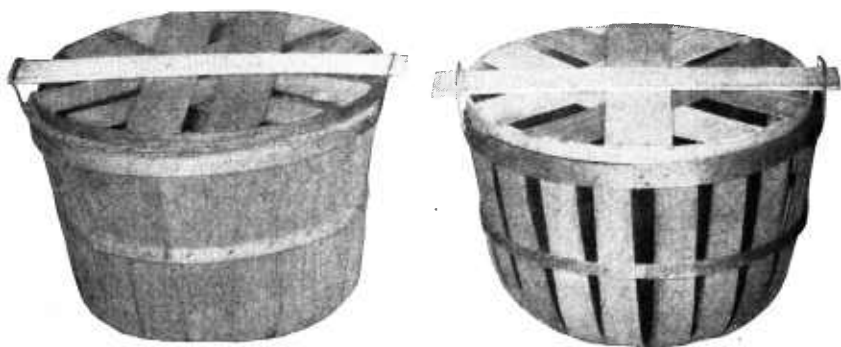


FIG. 7.—Solid and ventilated round stave baskets. The solid basket is recommended for peaches.

Carrier packing is also handicapped in these districts by scarcity of trained labor.

ROUND STAVE BASKETS.

The bushel round stave basket is employed almost exclusively in marketing the peach crop of Ohio, Michigan, New York, Oklahoma, Texas, and Missouri. In Georgia and in the Middle Atlantic States the firmer varieties are commonly shipped in round stave baskets, and in many instances even such early varieties as the Carman and Hiley have also been shipped in this package with good results. Two types of construction are shown in figure 7. In one there are spaces between the staves to provide ventilation, while the other, which is regarded as the most satisfactory shipping package, is solid. There is a tendency in the case of the ventilated basket for the fruit on the lower tiers in a car to be forced by the weight of the upper tiers into the spaces between the staves, thus causing severe bruising or cutting. There are several different types of covers for this basket, but the star cover shown in figure 8 is preferable to

other types, as it is more rigid, holds the fruit in place more securely, and is also more attractive in appearance than the others.

The proper placing and fastening of the cover should be emphasized. To perform this operation one end of the handle slat is inserted under the wire handle and the other end of the slat is then brought into place by forcing the other wire handle outward to permit its insertion. Care should be used in putting on the cover to avoid disarranging the pack. After the cover is in place the wire handles should be bent inward with a hammer, or by twisting the tops of the handles with pliers, and giving a half turn.



FIG. 8.—Basket with star cover and extension corrugated paper cap. When packed for shipment the wire handles should be bent inward and down on the handle slat to secure the cover.

For less than car-lot shipments wire fasteners are used as an additional precaution to prevent the cover from coming loose. In some cases two fasteners are used, one on each side halfway between the handles, but it is better to use four, placing two on each side, 4 to 6 inches from the handles. These fasteners are attached by inserting the end of the hook under the outside top hoop and bending the other end over and down on the rim of the cover.

A corrugated-paper cap is used under the cover to protect the fruit and prevent bruising. Recently it has been found that by making these caps of a diameter slightly larger than the package, so that they project somewhat from the cover rim, the fruit in the outer layer is protected from cutting and bruising. (See fig. 8.) The caps should always be placed with the smooth side next to the fruit.

The round stave basket is less expensive than the 6-basket carrier and can be filled more rapidly and cheaply. The element of time has

been one of the chief reasons for the widespread use of this package in southern districts. Trained packers are not required, as the fruit is usually poured into the basket, the top layer alone being arranged according to a definite system. If the fruit is packed in layers, each layer being arranged in concentric circles, there is little difference, if any, in the cost of packing round stave baskets and carriers.



FIG. 9.—Thirty-two-quart hampers are popular in Delaware and New Jersey.

HAMPERS.

The hamper has been in use for a longer time than either the 6-basket carrier or the round stave basket, and it is still popular in many of the leading production sections. (See fig. 9.) This container is frequently referred to as the Delaware or Jersey basket, because it was first employed extensively by growers in those States. At one time, prior to the general introduction of the carrier and the round stave basket, it was the principal shipping package in all sec-

tions except Georgia and the Pacific coast. It is still the leading package in Delaware, New Jersey, and Connecticut and is also popular in Virginia, West Virginia, New York, Maryland, and Pennsylvania. In New York it is used principally for early varieties.

As is the case with the round stave basket, the principal advantage lies in the fact that it can be quickly and economically packed. The 14 and 16 quart sizes are in general use, but in view of the fact that the 14-quart size is frequently confused with the 16-quart and has permitted the deception of consumers, there is a strong movement on the part of the trade to abolish the short-measure package. The 16-quart size is particularly suitable for tender varieties and is also desirable for use in shipping ripe fruit to local markets.

PACKING HOUSES.

Peach-packing houses east of the Rocky Mountains are of two general classes—the Georgia type, which is used almost exclusively in that State and also North Carolina, Virginia, West Virginia, Maryland, and New Jersey, and the Ohio type, which is also in use to some extent in New York and Michigan. The former type was originally developed for packing peaches in 6-basket carriers and the latter type for packing round-stave baskets. As a matter of fact, peach-packing houses in the North have not been standardized as to construction and equipment as they have been in the South, probably because many peach growers in the North produce apples and pears as well, and the same packing house is used for all. In New York much of the packing is done in connection with cold-storage houses.

The factors governing the choice of a packing-house location are simple but important. If the orchard is located on a railroad or is connected by a spur track, the packing house should without exception be built alongside of the track in order to do away with the necessity of hauling the packed fruit. In other cases the principal consideration is to reduce to a minimum the distance the loose fruit must be hauled, as peaches are far more likely to be bruised when hauled loose than after being packed. In a flat country, like the Fort Valley section in Georgia, the most desirable location is near the center of the orchard, or at a central point if the output of several orchards is packed through one house.

SOUTHERN PACKING HOUSES.

The typical southern peach-packing house (see fig. 10) is two stories high and of frame construction. The upper story or loft, which is used for the storage of crate material, is inclosed, and the lower floor, where the packing operations are carried on, is open. These houses are usually 30 to 40 feet wide and from 60 to 150 feet long. The fruit moves across the short dimension of the house, so that operations in a house less than 35 feet wide are very likely to be hindered by insufficient space for loose and packed fruit. As the crate material is stored in the loft the packages are usually assem-

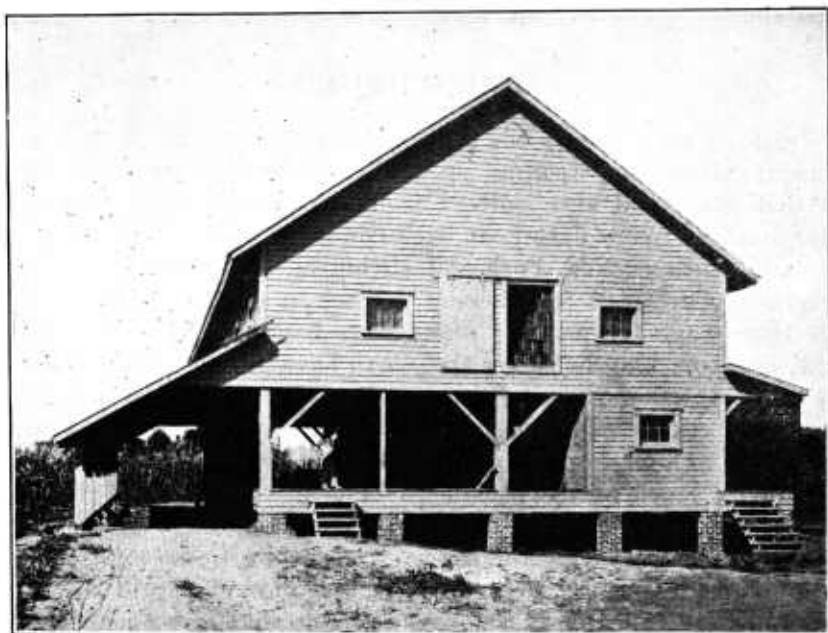


FIG. 10.—A typical Georgia peach packing house.

bled there and are supplied to the packers on the lower floor by means of chutes, which run either parallel or at right angles to the packing benches.

The first floor should be built at approximately the same height as the wagon bed, or the floor of the refrigerator cars if the house is located along a railroad siding. This height facilitates the handling of the fruit and also permits good ventilation. The packing-room ceiling should be about 10 feet high. Most packing houses have covered driveways, which serve the excellent purpose of protecting the fruit while the wagons are being unloaded and loaded, but which have the disadvantage of cutting off a part of the light.

LIGHTING.

As a matter of fact, the question of proper lighting is frequently neglected. This is especially noticeable at the height of the season, when packed crates are stacked high on one side of the house. This difficulty might be overcome by putting in hipped-roof skylights and light shafts over the sorters, where the additional illumination is most necessary. When the construction of the house can not be changed without excessive cost, the interior should be painted white. Some houses which are conducted most efficiently are equipped with electric lights over each bin.

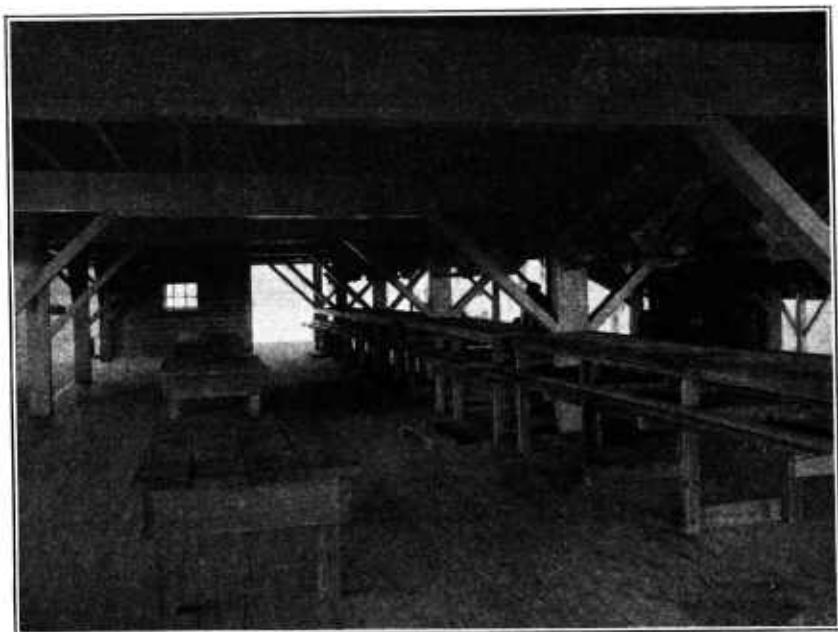


FIG. 11.—Interior of a packing house. Note the heavy nailing benches, packing tables, and crate chutes. The office is in the far corner.

EQUIPMENT.

As a general rule the packing benches are arranged in a long line down the center of the house. (See fig. 11.) This is the case whether the fruit is handled by machinery or by hand and, except in the case of machines, which have packing bins on both sides, it is the most desirable arrangement, as the fruit moves in an orderly manner from one side of the house to the other.

There are a few efficient houses in which the packing benches are placed in parallel rows across the house, but this arrangement is not so desirable either for hand operations or for sizing machines which

distribute the fruit into a single line of packing bins. A typical floor plan is shown in figure 12. The practice of arranging the packing benches in two parallel lines lengthwise of the house or in two lines back to back should be discouraged. In the first case it is necessary to carry the loose fruit around the end of the first row of benches to get to the second row. With the latter arrangement this objection is also true and the packers are disturbed whenever they are being supplied with fruit in addition to being required to do all of the grading.

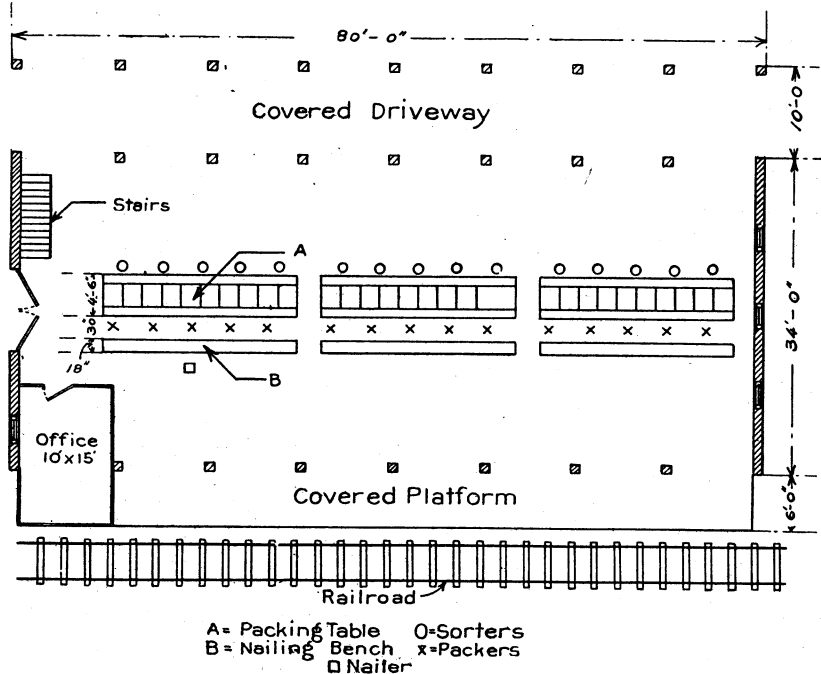


FIG. 12.—Floor plan of the packing house illustrated in fig. 11.

PACKING BENCHES.

The end view of a well-constructed bench equipped for packing 6-basket carriers is shown in figure 13. The proper height of the bench upon which the crate is placed is 27 inches from the floor. The height of the lower side of the bin is about 38 inches. The bins are about $2\frac{1}{2}$ feet long and about 24 inches wide and are made of burlap, ticking, or canvas and in some instances are supported by wire screen. All parts of the bin likely to cause bruising should be padded. There should be a sufficient slope toward the packer to permit the fruit to roll gently toward him.

CRATE CHUTES.

The crates are lowered from the loft to the packing floor by chutes. Two types that are in common use are shown in figures 11 and 14.

These chutes are kept supplied by boys, effecting a saving in labor costs and keeping the packing floor clear of extra crates. In the case of the chute shown in figure 11 the crates are delivered just above the

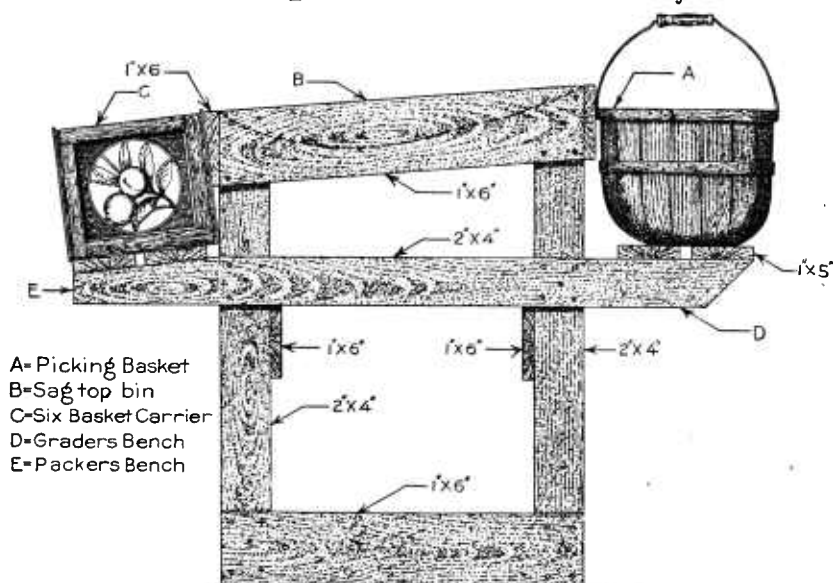


FIG. 13.—End view of a peach packing bench.

packing bench at about the height of the packer's head. Where the other type is used it is placed behind the packers at about the same height.

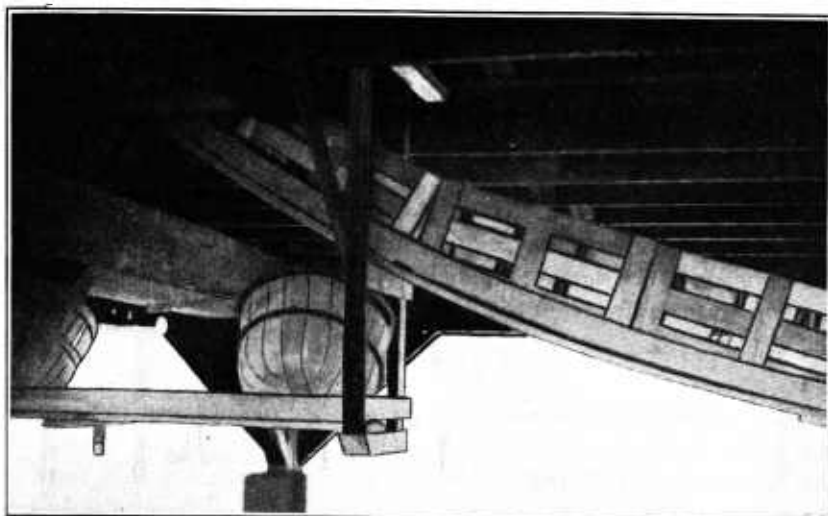


FIG. 14.—A popular crate chute which runs parallel to the packing benches.

CRATE CONVEYORS.

The majority of houses equipped with sizing machines are also provided with chain conveyors for carrying the packed crates to the nailing bench. (See fig. 15.) Such a conveyor can be run with the same power unit that operates the sizer and generally is a desirable part of the packing-house equipment. They should be equipped with an automatic stop to prevent an accumulation of crates at the nailing benches. The most common form of nailing bench consists of a low heavily built bench large enough to hold from 4 to 6 crates and provided with cleats upon which the ends of the crates rest. (See fig. 11.) These cleats raise the crate high enough to allow the bottom to bulge when the top is nailed on. Where crate conveyors are used

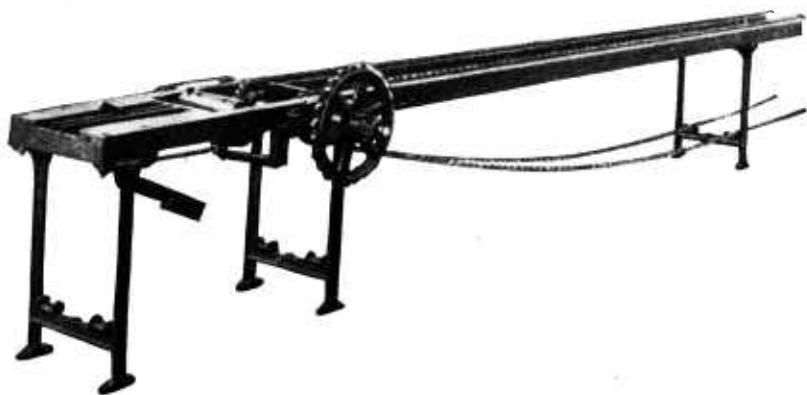


FIG. 15.—A crate conveyer used to carry packed carriers to the nailing bench. Such conveyers are equipped with an automatic stop.

the nailing benches are located in the center or at the end of the house; otherwise they are placed at a distance most convenient to the packers.

SHELVES FOR PARTITIONS.

Shelves to hold the partitions or dividing trays and baskets should be placed just above the packing bins at about the height of the packer's head. In figure 11 a shelf for this purpose is placed between the two crate chutes from the loft.

SIZING MACHINES.

The use of machines for grading and sizing peaches in Georgia and other Southern sections has developed in the past few years. At this time probably 40 per cent of the crop is handled in this manner, the remainder being graded and sized by hand. There is only one type of machine which has been introduced extensively and which has given general satisfaction. This machine consists of three

parts—a roller sorting conveyor, the sizing mechanism and distributing belts, and the receiving bins. (See fig. 16.) The peaches are fed to the sorting conveyor by a hopper. This conveyor consists of a series of wood rollers which are carried up an incline by two lug chains, one on each side. As the belt moves forward these rollers are dragged over two strips, which causes them to revolve. In this way the peaches which rest in the spaces between the rollers are also revolved slowly as they pass before the sorters, so that the entire surface of each peach can be examined without handling.



FIG. 16.—A popular sizing machine used extensively in the South.

A longitudinal section of such a machine is shown in figure 17 and a view of the sizing mechanism in figure 18. The sizing mechanism consists of rollers operating in pairs. The rollers marked *A* are spaced at regular intervals and those marked *B* are mounted to swing in arcs and cooperate with the spaced rollers to define the size of the opening. As the belt is carried forward these rollers are progressively lowered by means of the steps shown at points *C*, thus increasing the size of the opening through which the peaches may be discharged to the distributing belts at point *D*. The distributing belts carry the various sizes to the packing bins. Such machines are built in different lengths, but the most popular size accommodates 15 packers and has about 36 feet of bin space.

The United States Department of Agriculture also has developed a machine which can be built at less expense and which at the same time insures the proper handling of the fruit. This machine is de-

scribed in detail in Department Bulletin 864, A Peach Sizing Machine. In this machine the roller sorting conveyor is used for the grading operation, but the sizing is done by means of diverging ropes. Figure 19 shows a general view of this machine. Under

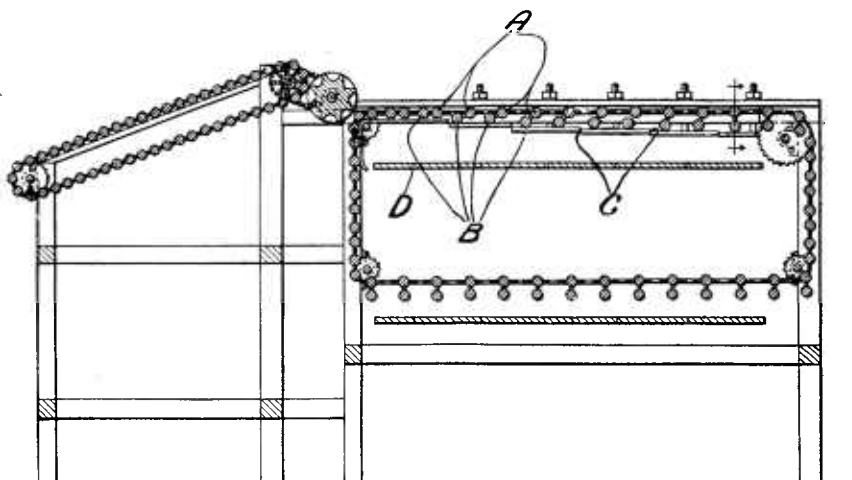


FIG. 17.—Longitudinal section of the grading and sizing units: A and B, sizing rollers; C, steps to permit enlarging of opening; D, distributing belt.

ordinary circumstances fruit may be sized more rapidly and accurately by machinery than by hand, and also at a cost considerably less than that of hand operations, especially where a sorter is employed for every packer.

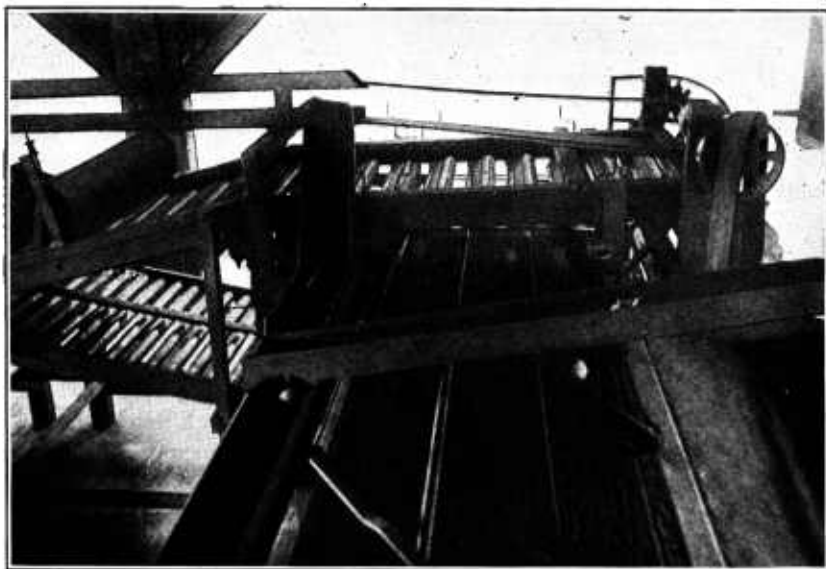


FIG. 18.—View of sizing mechanism.

OPERATION.

The supervision of packing operations is usually done by an experienced foreman. These men are recruited from the ranks of professional managers who travel from point to point, following the progress of the fruit and vegetable season. In the Georgia peach districts many of them come directly from Florida at the close of the citrus shipping season.

Until recent years most of the packing was also done by professional packers, but at the present time much of it is being done by local help. The work is such that it may be performed by girls.

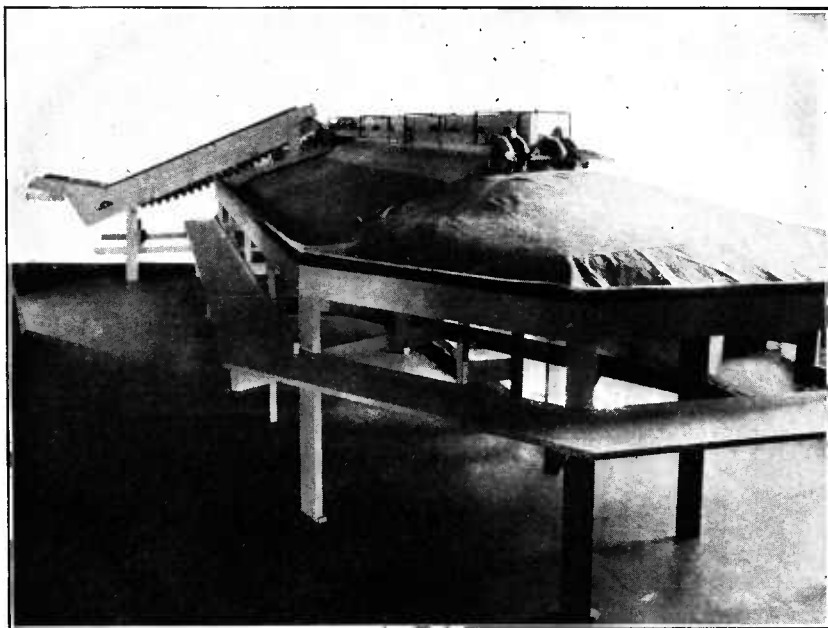


FIG. 19.—Sizing machine developed by U. S. Department of Agriculture and described in Department Bulletin 864.

Often college students find peach packing a profitable way of spending their summer vacations. It seems probable that local help will be employed more extensively as time goes on, as experience has shown that such employees are more easily handled and more responsible than itinerant labor. Professional packers put up around 125 to 150 crates per day and some pack as many as 200 crates where the sizes are large and where they are not required to do any sorting.

The men who make the crates and who do the nailing are usually experts who travel from one section to another as the season progresses. The average nailer will make, or nail up, about 800 crates in a 10-hour day, and some of the best have been known to do considerably more.

MOVEMENT OF THE FRUIT THROUGH THE HOUSE.

As the sizing machines are almost invariably placed in the center, the long way of the house, the fruit moves across the width. Peaches are delivered in baskets, and where it is necessary to place them more than one deep, care should be taken to see that the upper tier rests on the edges of the baskets of the lower tier, so that the fruit will not be bruised.

Where sizing machines are used the fruit should be placed as near as possible to the feeding hopper. The fruit is dumped into

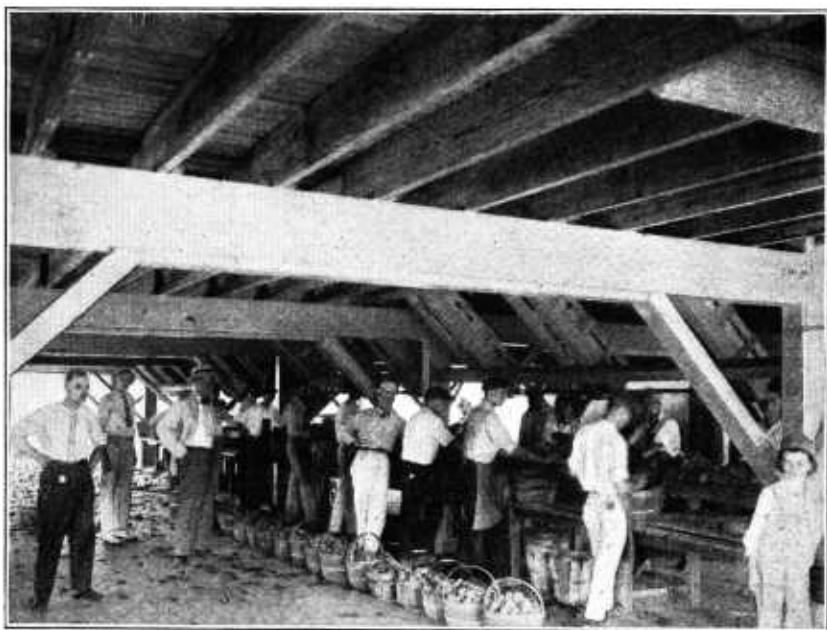


FIG. 20.—Georgia packing house. The men on this side of the packing bench are grading the fruit for the packers who stand opposite.

the hoppers, and where pickers' tickets are used they are taken up at this point and sent to the office. The fruit is then sorted as to grade, sized, and distributed to the packing bins. After being packed the crates are carried either by the packers or by a mechanical conveyor to the nailing bench, where the tops are nailed on. The crates are then hauled to the loading point, or, in those houses which are located along a railway spur, loaded into the car immediately. If it is necessary to stack the packed carriers in the house, the crates should be stacked right side up and car strips should be used to prevent the bruising which ordinarily results from stacking the packages on the bulged top. Crates are often stacked on the side, but this practice results in disturbing the pack and should be discouraged. Where there are no machine graders the general operation is

the same, except that the field-run fruit is either poured from the baskets directly into the bins or is placed upon a shelf to be graded into the bins by the sorters. (Fig. 20.)

PACKING SIX-BASKET CARRIERS.

The advantages of marketing peaches in the 6-basket carriers are not obtained automatically through the use of this package, but depend very largely on the efficiency with which the grading and packing operations are performed. The round stave baskets or hampers require no special experience or training, as the fruit is usually poured into the baskets and leveled off on the top, the arrangement, except for the face, being a matter of small importance. Carrier packing, on the contrary, is a technical operation which requires skill and a knowledge of the definite system of placing the fruit in the baskets.

SORTING.

Where machines are used the fruit is sorted on the roller or belt conveyors and is then sized and distributed mechanically. This arrangement is particularly desirable, as the sorters are employed at maximum efficiency, the number of employees depending upon the quality and condition of the orchard-run fruit.

Most of the grading and sizing operations are still carried on entirely by hand. Figure 20 shows a typical Georgia packing table. The sorters stand on one side of the table and the packers on the other. The long packing bin is divided into sections, each sorter using two, one for the larger sizes and one for the smaller. In addition to sizing the fruit into these two classes, the sorters also place the immature, soft, diseased, scarred, and otherwise defective specimens in cull baskets provided for that purpose. (In localities where there is a local market it is customary to resort this cull fruit, as there generally is a good demand for slightly overripe and defective peaches, which, although not suitable for long shipment, are satisfactory for immediate use.) The sorters take up two or three peaches at a time in each hand. One side of the peach is inspected before it is taken out of the orchard basket and the other as it is being transferred to the bin.

The efficiency of a crew of sorters working in this way is extremely variable, as one person is employed to grade for each packer without regard to the quality of the fruit. If there is a large percentage of defective peaches and the sizes are variable, the sorters have plenty of important work to do, but when the fruit is clean and fairly uniform in size there is little to do but to transfer the fruit from the basket to the packing bin. Where this condition prevails the fruit is graded by the packers themselves, but this method is

slower and can give satisfaction only when the fruit is of exceptionally good quality. There is also considerable difference in the number of crates per day which can be packed by the different members of the crew and sorters working with fast packers may be called upon to handle half again as many peaches as those who are working with the slower packers. Most packing houses pay sorters by the day and no record is kept of the amount of work done by each. Some growers, however, believe it advisable to keep a check on this work purely for the psychological effect, as it has been their observa-

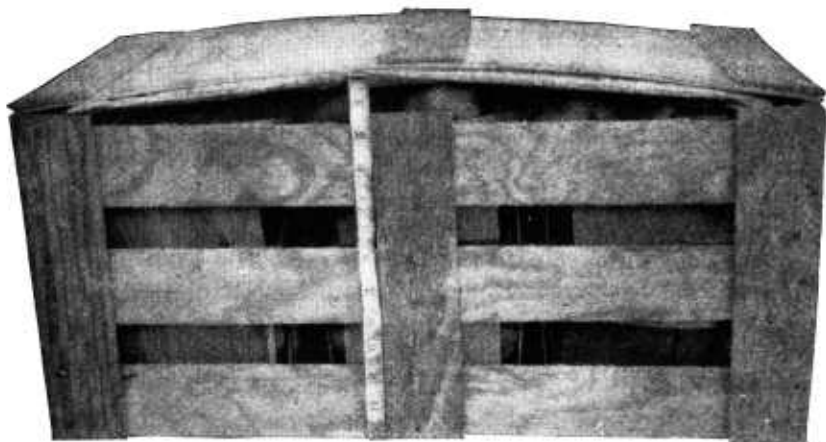


FIG. 21.—Packed carrier showing a proper bulge.

tion that more work is done when the employees know that a record is being kept.

PACKING.

The carrier is placed on the bench in front of the packing bins. The packer, who uses both hands, reaches over it for the fruit in the bins, thus performing the operation with a minimum amount of effort. Each tier of baskets should be filled one layer at a time. If one basket is completely filled before the others are started the thin veneer sides may be bulged out and the remaining baskets pressed out of shape. When the bottom baskets are finished the dividing tray is put in and the upper baskets packed in the same manner. It is essential that the peaches in each layer fit tightly in order to reduce to a minimum the amount of settling in transit. To further counteract this settling the crates should be packed high enough to give a good bulge.

The exact height of the bulge will vary to some extent with the size of the peaches, the larger sizes generally showing a higher bulge than the smaller, but with a good tight pack it should be from $1\frac{1}{2}$ to 2

inches. (See fig. 21.) The most common difficulty in this connection is to get the pack high enough, but some growers go to the other extreme and pack the crate with a bulge of around $2\frac{1}{2}$ inches, which is likely to cause an excessive amount of bruising. A slack pack is likely to give trouble, as the fruit is generally so shaken up in the car while in transit that the order of arrangement, which is one of the principal advantages of the package, is disturbed. The pack should be slightly lower at the ends than in the center, and the surface should be smooth, so that the cover will touch each peach with equal pressure. The diagonal system is used in all the standard packs, as there is less likelihood of bruising the fruit than in the case of straight packs, where the peaches in the upper layer rest directly on those below. The following packs are considered standard by the Georgia Fruit Exchange:

STANDARD PACKS FOR GEORGIA PEACHES.

	Peaches.		Peaches.
3-3 pack, 6 layers, 306 peaches:		2-1 pack, 6 layers, 162 peaches:	
Bottom layer.....	15	Bottom layer.....	9
Middle layer.....	18	Middle layer.....	9
Top layer.....	18	Top layer.....	9
To basket.....	51	To basket.....	27
3-2 pack, 6 layers, 258 peaches:		2-1 pack, 6 layers, 138 peaches:	
Bottom layer.....	13	Bottom layer.....	8
Middle layer.....	15	Middle layer.....	7
Top layer.....	15	Top layer.....	8
To basket.....	43	To basket.....	23
2-2 pack, 6 layers, 204 peaches:		2-1 pack, 6 layers, 108 peaches:	
Bottom layer.....	10	Bottom layer.....	6
Middle layer.....	12	Middle layer.....	6
Top layer.....	12	Top layer.....	6
To basket.....	34	To basket.....	18
2-2 pack, 6 layers, 180 peaches:			
Bottom layer.....	10		
Middle layer.....	10		
Top layer.....	10		
To basket.....	30		

NORTHERN PACKING HOUSES.

Northern peach-packing houses have not been standardized as to construction and equipment as have those of the South. The only type which has been developed particularly for packing peaches originated in northern Ohio, but similar houses have since been constructed in New York and Michigan. However, most of this fruit

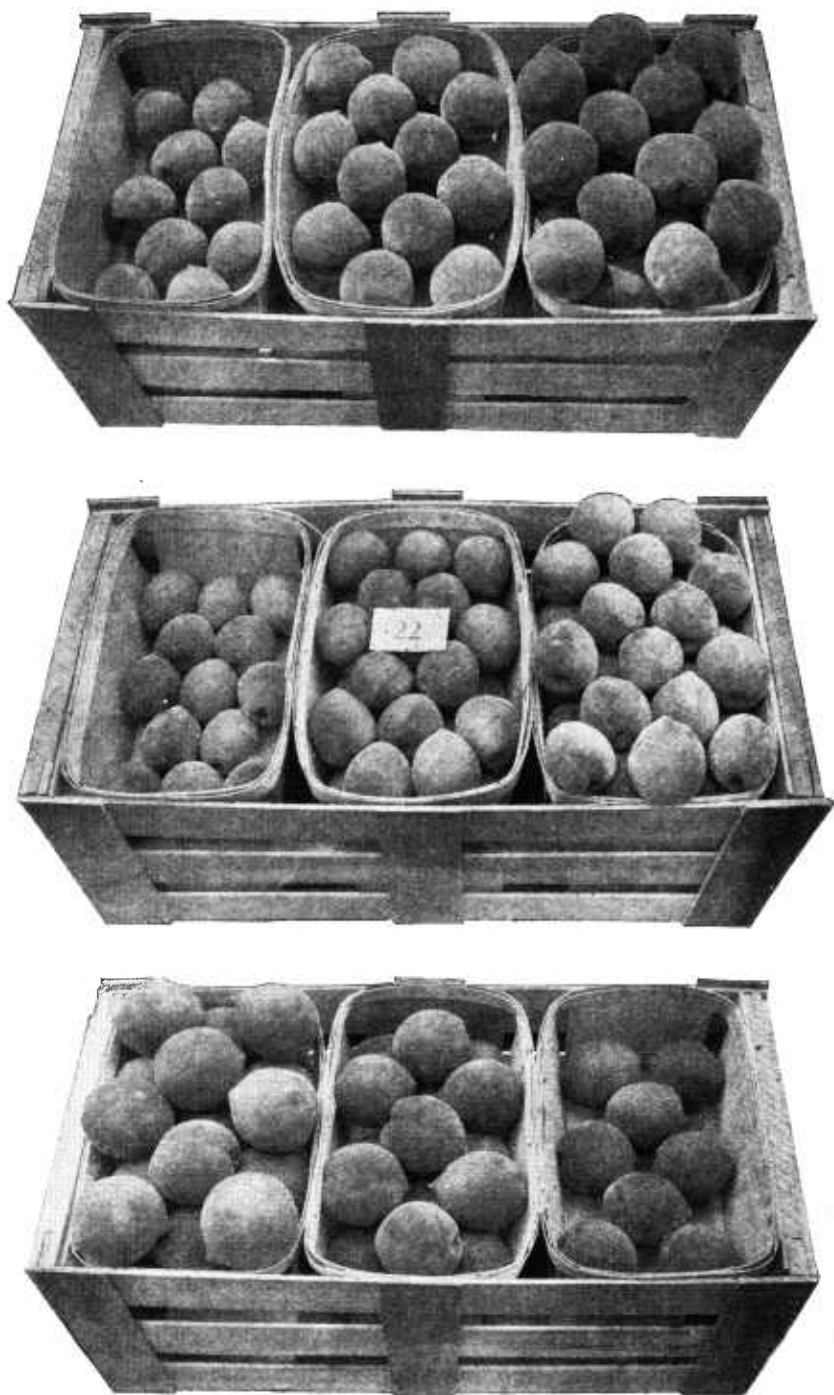


FIG. 22.—Above, 2-2 pack ; middle, 3-2 pack ; below, 2-1 pack.

is still packed in houses which are used primarily for other purposes. A floor plan of a typical Ohio house is shown in figure 23. This house is 175 feet long and 36 feet wide, with a 10-foot covered drive. The sizing machines are placed in pits 14 feet square and 3 feet deep, as shown in figure 24.

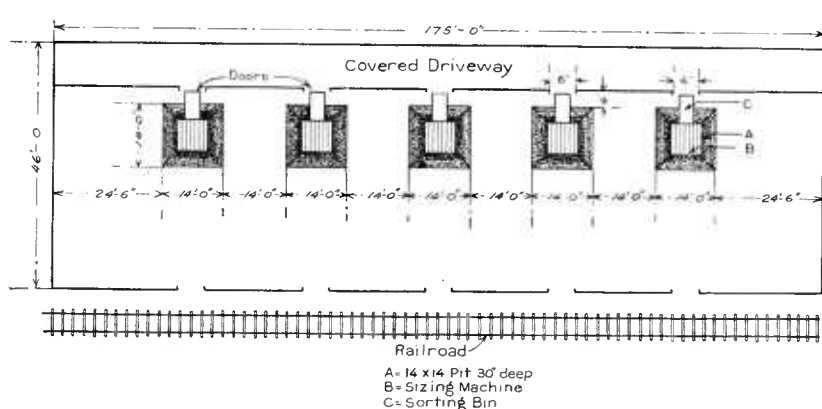


FIG. 23. Floor plan of typical northern packing house.

OPERATION.

The peaches are hauled from the orchards in bushel baskets and are emptied directly from the wagons to the sorting conveyor belt, which extends to the open receiving doors. In some instances a wide padded hopper is used in place of the sorting belt, but these are less satisfactory, as the fruit can not be inspected so easily and there

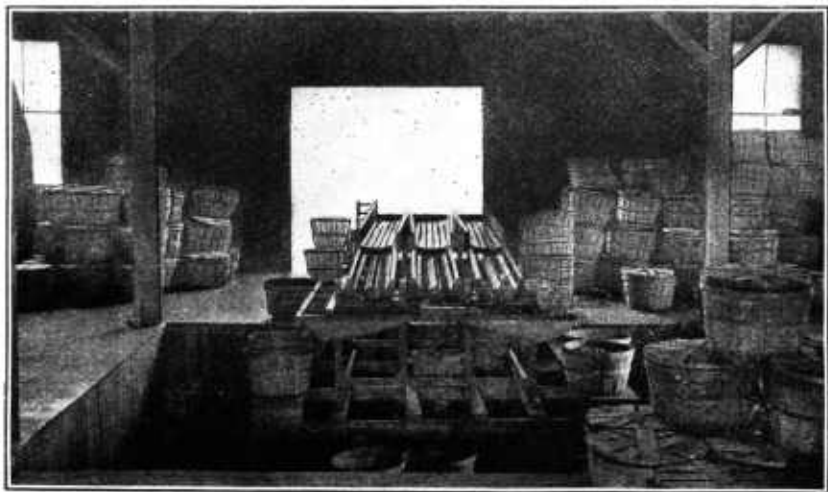


FIG. 24.—Ohio peach packing house, showing pit in which the packers work.

is more likelihood of bruising. The fruit then passes to the sizing machine.

As the fruit is sized it is delivered by canvas chutes into the baskets. The packers stand at the sides of the machine, filling the



FIG. 25.—An attractively faced bushel basket.

baskets, which are set on the edge of the pit when they are full. The top layer is generally arranged in concentric rings by packers, who also stand in the pit. (See fig. 24.) As soon as this operation is completed a corrugated-paper pad is placed on the top and the cover is attached by a man who works at the edge of the pit, but who does not stand in it. A short, flat iron bar with a sharpened turned edge is used in forcing the end of the strip on the cover into the wire handle. The handles should then be bent down to secure the cover. In some localities the top is covered with a red net or gauze instead of the regular wood cover. This has the effect of giving a more attractive color to the peaches, but the fruit is very likely to be bruised.

SIZING MACHINES.

Several types of sizing machines are used in northern producing sections, but the type shown in figure 26 is the one most popular. Such machines consist of a canvas sorting belt or hopper and the sizing mechanism, composed of a steel roller with



FIG. 26.—A popular type of peach sizer used in the northern section.

direct offsets in its diameter and an endless spring coil. The spring pulls the peaches along against the roller, which revolves outward, and, as the fruit progresses, the distance between the spring and the roller is increased by the offsets until it is sufficient to permit the fruit to fall through into the canvas chutes below. Some of these machines are equipped with six rollers and have a capacity of 125 to 150 bushels per hour.

PERSONNEL.

Twelve to fifteen people are required in the pit to fill the baskets and ring-face the top layer. Usually two or three women are employed at the sorting belt, two men attach the covers and stamp them, and one man keeps a record of the fruit and gives receipt slips to the growers.

PACKING.

The practice of ring-packing peaches in round stave baskets is followed to a limited extent. This operation is performed by placing the peaches in concentric rings throughout the baskets. Such an arrangement is more attractive than the ordinary pack, and with fruit of average size an expert packer can ring-pack from 100 to 125 baskets a day. Observations have shown that there is little benefit as far as the carrying of the pack to market is concerned, and in view of the fact that a large part of the northern crop is used for home canning, any operation which increases the cost of the product to the consumer may be regarded as of questionable value.



FIG. 27.—Shaker used for leveling and settling pack before ring facing.

Without regard to whether the fruit is ring-packed or not, the top layer should extend at least one-half inch above the top hoop and about an inch higher in the center. The proper height of the bulge is very important, for if the fruit is too low the package will arrive on the market slack, and on the other hand too high a bulge almost invariably results in crushing and bruising the fruit as well as interfering with the proper adjustment of the cover. A proper foundation for a ring face may be secured by the use of a shaker of the type shown in figure 27.

HAULING TO THE CAR.

Most of the hauling from packing houses to the cars is now done by motor trucks. The cost of hauling by truck is probably about the same as by wagon, but is much more rapid and requires the em-

ployment of fewer men. Wagons used for this purpose should be equipped with springs (see fig. 28). Both trucks and wagons frequently are provided with hinged sides which may be dropped to facilitate loading and unloading.

A truck equipped with a 2-tier rack is shown in figure 29. The proper method of loading 6-basket carriers is right side up, and not on the side, as the latter method permits the fruit to be shaken out of place, so that it presents a poor appearance upon arrival in the market. A layer of boards or hinged deck such as is illustrated in figure 5 is used to prevent the bruising which would ordinarily result from stacking the crates on the bulge.



FIG. 28.—Well constructed wagon for hauling crates. Note the springs in the center and at both ends of the wagon and hinges on side. The side is lowered when unloading into car. Capacity, 120 baskets.

Hauling is often done over rough roads, and where this is the case it is especially necessary to observe these precautions.

GRADING METHODS.

There is a wide variation in the efficiency of the grading practices of different growers and shippers in the same producing sections and also in the grade terms used in the different districts. At the present time there are no standard peach grades, and even where the same terms are used they are not applied uniformly to fruit of the same quality and size. Market quality refers to the stage of maturity at time of picking and to freedom from those defects which affect the appearance or keeping quality of the fruit. The usual practice in both southern and northern sections is to pack but one quality grade, which is separated into several classes on the basis of size. The grading

terms used under this system do not refer to the market quality but to the size classifications.

In commercial usage the size of peaches packed in 6-basket carriers is commonly indicated in terms of the style of pack. The 2-1 pack is used for peaches ranging from 18 to 27 peaches in each 4-quart basket, the 2-2 pack for those 30 to 36 per basket and the 3-2 and 3-3 packs for those varying from 43 to 51.

The 2-1 pack has been referred to as Extra Fancy grade, the 2-2 pack as Fancy grade and the 3-2 and 3-3 packs as Choice grade.

In northern districts, where the fruit is usually packed in round stave baskets, the various sizes have been commonly called AA, A,



FIG. 29.—Truck equipped with two-tier rack for hauling crates from the packing shed to the car.

and B. Generally speaking, in the 1920 season the AA grade referred to peaches which were $2\frac{1}{4}$ inches or larger in diameter, A grade taking in sizes down to $1\frac{1}{2}$ inches, with practically no stock being shipped as B grade, but in past years some houses have used these terms with the following meanings: AA, $2\frac{1}{4}$ inches in diameter or larger; A, $1\frac{7}{8}$ to $2\frac{1}{4}$ inches; B, $1\frac{1}{2}$ to $1\frac{7}{8}$ inches.

These variations show that the peach industry is very much in need of standard grades. The Federal Bureau of Markets and Crop Estimates has conducted studies for several years looking toward the establishment of a uniform standard, but apparently no satisfactory basis could be formulated without changing the system of grading now in use by the trade. More recent investigations have indicated, however, that a satisfactory standard may be developed.

Instead of using grade terms to indicate variation in the size of the fruit, such terms should apply wholly to market quality. In this way a No. 1 pack would consist of peaches of one variety which were of property maturity and free from all defects which would injure the appearance or keeping quality. Peaches of lower quality which still had a merchantable value should be designated as grade No. 2. A careful study of this problem has shown that a uniform standard of quality for all districts is entirely practicable.

Almost unanswerable objections to a uniform standard for peaches have always developed in connection with size classifications. The reason for this has been largely a matter of variety. It is impossible to fix arbitrarily a minimum size for the first grade of the Elberta variety, which constitutes the bulk of the northern crop, that at the same time would serve as a reasonable standard for the Mayflower, one of the early Georgia varieties, or even for the early varieties which are more generally grown on the Atlantic coast, such as Carman and Hiley. By stating the size separately from the grade these complications are avoided and peaches in Georgia carriers can be quoted as of No. 1 quality and of a certain size. These sizes can be indicated on the carriers by referring to the style of pack as 2-1 pack, 6 layers, or by stating the numerical count. This style of pack is shown in figure 22. For peaches packed in round stave baskets or hampers the size can be indicated by referring to the minimum diameter, as "U. S. No. 1, 2 in. minimum."¹

The conclusion must be reached by anyone who investigates the grading and handling of peaches in producing sections east of the Rocky Mountains, both in the North and South, that although many individual growers and shippers maintain their standards with scrupulous care, there is still a need for more careful attention to the details of harvesting, grading, and packing. Each year thousands of dollars are lost as a result of lack of knowledge or neglect, and even at the present time there is no concerted effort on the part of peach growers throughout the country to lend their assistance to the establishment of standard grades.

¹The grades for peaches which have been prepared tentatively as a basis for further investigations and for the purpose of obtaining criticisms and suggestions from those who are interested are subject to change without notice, and therefore are not incorporated in this bulletin. They may be had by applying to the Bureau of Markets and Crop Estimates, Washington, D. C.